

# Syllabus

## *Syllabus*

Titul dl curs	Statistical Methods for Business Analysis
Codesc dl curs	25559
Titul suplementar	
SSD	STAT-01/A
Lingaz	Inglese
Curs de laurea	Corso di laurea magistrale in Imprenditorialità e Innovazione
D'autri cursc de laurea (cursc deberieda)	
Dozenc	<p>prof. Alessandro Casa, Alessandro.Casa@unibz.it <a href="https://www.unibz.it/en/faculties/economics-management/academic-staff/person/46549">https://www.unibz.it/en/faculties/economics-management/academic-staff/person/46549</a></p> <p>dr. Giulia Bertagnolli, Giulia.Bertagnolli@unibz.it <a href="https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49312">https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49312</a></p>
Assistent didatich	
Semester	Secondo semestre
Ann/Agn de stude	1
Credic universitars	6
Ores de insegnament	36
Ores de laboratore	18
Ores de stude individual	-
Ores de riceviment prevedudes	18
Ressumè di contegnus	<p>This course begins with a review of key principles of statistical inference and then introduces core concepts in statistical learning. Topics include linear regression and its extensions, advanced regression techniques such as decision trees, logistic regression, classification methods, model selection strategies, and unsupervised learning approaches like principal component analysis</p>

	<p>and clustering. Throughout the course, students will work hands-on in R, applying techniques to real-world datasets drawn from business scenarios. By the end, students will be able to choose suitable statistical models, apply them to a range of business problems, and effectively communicate their analytical insights.</p>
<b>Argomenc dl curs</b>	<ul style="list-style-type: none"> <li>- Ripasso dell'inferenza statistica: variabili casuali, intervalli di confidenza e test di ipotesi.</li> <li>- Introduzione ai concetti di apprendimento statistico: vocabolario e nozioni di base, approcci parametrici e non parametrici, obiettivi predittivi e inferenziali, trade off bias-varianza, apprendimento supervisionato e non supervisionato.</li> <li>- Regressione lineare ed estensioni: regressione lineare semplice e multipla, stima e valutazione del modello, assunzioni del modello, strumenti inferenziali, predittori qualitativi, effetti di interazione, regressione polinomiale, nozioni di base sulla regressione nonparametrica</li> <li>- Classificazione: introduzione alla classificazione, regressione logistica, stima del modello, valutazione dei classificatori.</li> <li>- Altre tecniche di apprendimento supervisionato: alberi, spline, modelli additivi</li> <li>- Selezione/valutazione del modello e valutazione della sua complessità: metodi di ricampionamento, convalida incrociata e criteri informativi.</li> <li>- Apprendimento non supervisionato: strumenti di clustering come k-means e clustering gerarchico, analisi delle componenti principali</li> <li>- Applicazioni con il software R</li> </ul>
<b>Paroles clef</b>	<p>statistical learning, regression, classification, clustering, dimensionality reduction, model selection</p>
<b>Prerequisic aconsiés</b>	<p>No formal prerequisites are required. Nonetheless, knowledge of basic concepts in descriptive and inferential statistics is useful, and attending a pre-course in mathematics/statistics is recommended.</p>
<b>Cursc propedeutics</b>	
<b>Modalité de enseignament</b>	<p>In-person lectures and computer labs. Whenever possible, lectures will be structured to prioritize in-class time for discussions, and practical applications.</p>
<b>Oblianza de frecuencia</b>	
<b>Obietifs formatifs y competenzes da arjonje</b>	<p>INTENDED LEARNING OUTCOMES (ILO)</p>

ILO 1: KNOWLEDGE AND UNDERSTANDING

ILO 1.a

The student acquires advanced knowledge and understanding of the theories and tools for the economic analysis of business decisions;

ILO 1.b

The student acquires knowledge and understanding of the theories and tools of statistical analysis for making market forecasts;

ILO 1.c

The student acquires advanced knowledge and understanding of business analysis tools and solutions for the development of innovations and organisational knowledge;

ILO 1.d

The student acquires knowledge of quantitative models for the formulation of forecasts necessary to guide management decisions and to predict the life cycle of a product and a sector.

ILO2: ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING

ILO 2.a

Ability to acquire and select information that may be relevant from an entrepreneurial point of view, also in economic-productive contexts different from those studied;

ILO 2.b

Ability to select business economics models, suitable for the appropriate analysis of a specific economic-social and productive context;

ILO 3: AUTONOMY OF JUDGEMENT

ILO 3.a

Acquire the ability to make predictions, such as analysing the future consequences of entrepreneurial, managerial and operational choice;

ILO 3.b

Autonomy of judgement is developed in the training activities carried out for the preparation of the thesis, as well as in the exercises that accompany the lectures and that involve group discussions and the comparison of individual analyses carried out by students in preparation for the lecture.

ILO 4: COMMUNICATION SKILLS

	<p>ILO 4.a Acquire the ability to describe and communicate in an intercultural context, in a clear and precise manner, problematic situations typical of the management of a new enterprise and the development of innovation, such as, for example, the conditions for the validation of a problem or solution, the prospects and risks associated with a business model or an innovation project. The development of communication competences assumes heterogeneous situations such as, for example, the presence of internal stakeholders (e.g. colleagues, managers, owners), or external stakeholders (e.g. potential investors, suppliers and other business partners) and the ability to sustain an adversarial process;</p> <p>ILO 4.b The achievement of these objectives is assessed in the course of the training activities already mentioned, as well as in the discussion of the final thesis.</p> <p>ILO 5: LEARNING SKILLS</p> <p>ILO 5.a Acquire the ability to study independently, to prepare summaries;</p> <p>ILO 5.b Acquire the ability to identify thematic connections and to establish relationships between different cases and contexts of analysis;</p> <p>ILO 5.c Acquire the ability to frame a new problem systematically and to generate appropriate taxonomie;</p> <p>ILO 5.d Acquire the ability to develop general models from the phenomena studied.</p>
<p><b>Obietifs formatifs y competenzes da arjonje (informazions suplementares)</b></p>	
<p><b>Sort de ejam</b></p>	<p>Assessment (for both attending and non-attending students):</p> <ul style="list-style-type: none"> <li>- Written Exam: Exercises and review questions (65% of the final grade) (ILOs 1.e, 1.g, 1.h, 3.a, 3.b, 5.a, 5.b).</li> <li>- Data Analysis Project: Group project in which students select and analyze an interesting dataset using the tools learned in the course. Groups will present their work at the end of the course</li> </ul>

	<p>(35% of the final grade; optional) (ILOs 2.a, 2.c, 4,a, 5.c, 5.d).</p> <p>Notes:</p> <ul style="list-style-type: none"> <li>- For students who do not complete the project, the written exam will count for 100% of the final grade.</li> <li>- Project grades remain valid for one academic year.</li> </ul>
<b>Criters de valutazion</b>	<p>Written exam: understanding of statistical concepts, correct interpretation of results of statistical analyses, clarity and precision of explanations.</p> <p>Data Analysis Project: Quality and clarity of the presentation, adequacy and appropriateness of analyses with respect to dataset characteristics</p>
<b>Bibliografia obligatora</b>	<p>James, G., Witten, D., Hastie, T., Tibshirani, R. <i>An Introduction to Statistical Learning with Applications in R</i>. Springer, 2013. Freely available at <a href="http://www-bcf.usc.edu/~gareth/ISL/">http://www-bcf.usc.edu/~gareth/ISL/</a></p> <p>Slides and lecture notes provided</p>
<b>Bibliografia aconsieda</b>	<p>Bishop, C. M. (2006). <i>Pattern recognition and machine learning</i>. New York: Springer.</p> <p>Agresti, A., Finlay, B. <i>Statistica per le scienze sociali</i>, Pearson, 2009.</p> <p>Hyndman, R.J. and Athanasopoulos, G. <i>Forecasting: principles and practice</i>, 2nd edition, OTexts: Melbourne, 2018.</p> <p>Cicchitelli, Giuseppe. <i>Statistica. Principi e metodi</i>. Pearson, 2008.</p> <p>Azzalini, Adelchi, and Bruno Scarpa. <i>Data analysis and data mining: An introduction</i>. OUP USA, 2012.</p> <p>Grigoletto, Matteo, Laura Ventura, and Francesco Pauli. <i>Modello</i></p>

	<p>lineare: teoria e applicazioni con R. G Giappichelli Editore, 2017.</p> <p>Johnson, Richard A., and Dean W. Wichern. "Applied multivariate statistical analysis." New Jersey 405 (1992).</p>
<b>Deplù informaziuns</b>	
<b>OSS</b>	Buona salute, Lotta contro il cambiamento climatico, Ridurre le disuguaglianze, Buona occupazione e crescita economica